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Retirement Guarantees in Mandatory Defined Contribution Systems

Abstract

Most public pension systems, whether they are of the predominant pay-as-you-go defined benefit type or of the defined contribution type, include guarantees for retirement income. The guarantees come in different and distinct forms, with the two polar cases being the universal pension (such as in the United Kingdom and Argentina) and the topping-up to a minimum pension level (such as in Germany and Chile). The paper reviews the design of such guarantees in a large set of countries and discusses the economic rationale and incentive structure resulting from these designs. It also reviews past experience for a number of countries, paying particular attention to the importance of changes to these guarantees over time and inflation. Based on the analysis, the paper will draw conclusions as to whether these guarantees are an effective instrument to protect against low retirement income and evaluate advantages and disadvantages of different designs.

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The published version of this Working Paper may be found in the 2003 publication: *The Pension Challenge: Risk Transfers and Retirement Income Security*.

The Pension Challenge

Risk Transfers and Retirement Income Security

EDITED BY

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Chapter 11

Retirement Guarantees in Mandatory Defined Contribution Systems

Jan Walliser

Risk protection for retirees has become one of the centerpieces of the debate how to organize retirement systems. The global push for a larger role for defined-contribution (DC) plans has raised the question how retirees should be protected from capital market risk. Proponents of individual investment pension accounts often consider these risks to be as easily manageable and far outweighed by the opportunities offered by a DC system. Opponents contend that the risks of individual investment are large and that defined-benefit (DB) pension systems are more appropriate for mandatory public systems.

Notwithstanding the merits of both arguments, all implementations of mandatory public DC plans around the world in fact feature some form of guarantee. In some cases, the government maintains a public benefit independent of past contribution and wage history (“flat benefit”); in others, it tops up retirement savings. Some systems also offer guarantees on the rate of return of retirement savings.¹ Protecting retirees from poverty is a driving force behind the discussion on appropriate retirement guarantees.

Guarantees are neither free nor cheap. From an economic viewpoint, the guarantor faces the costs of these guarantees *ex ante*, even though they may only rarely require outlays. The allocation and management of risks crucially affects the extent to which retirement income can be effectively prefunded and the extent to which taxpayers are exposed to changes in the size of retiree cohorts (Smetters, 2001). Hence, the risk aspect has macroeconomic implications. Moreover, interventions by the guarantor may have behavioral impacts because participants have the tendency to expand their risk exposure if a third party guarantees these risks. Providing as much up-front information as possible to policymakers about macroeconomic and behavioral implications guarantees is therefore an important task for economists.

Kent Smetters provided helpful comments and advice. The opinions expressed in the chapter are those of the author and should not be attributed to the World Bank.

This chapter discusses guarantees offered under mandatory public pension systems around the world.² To set the stage, the next section outlines interactions between guarantees and strategies to limit governments' risk exposure. The important conclusion is that the evaluation of these guarantees must go hand in hand with the regulation and design of the underlying public DC system. Next we compare a number of actual implementations of guarantees and analyze their particular risk allocation and risk management mechanisms. A final section concludes.

Retirement Guarantees: Understanding their Costs and Managing their Risks

Retirement guarantees come in two basic forms: contingent payments, and noncontingent payments. The first category includes benefits based on an income or means tests as well as minimum rate of return guarantees. The second category includes benefits that are paid independent of incomes and rates of return, such as the so-called flat pension.

The financial impact of noncontingent payments can be more easily assessed, because the process does not involve evaluating risks that the government may be assuming on behalf of the individual. To take the universal flat benefit as an example, its costs depend largely on fairly easily predictable demographic developments, since everybody above a certain age would receive an identical benefit. If an inflation-protected flat benefit is set sufficiently high, it also automatically protects people from poverty. However, it would be poorly targeted and would require pending considerable resources on people who are far above any notion of the poverty line. The economic impact of noncontingent payments is similar to giving people an additional safe asset. This additional safe asset would entice people to increase their holdings of risky assets and to increase their risk exposure. However, if the government could credibly commit to not increase its assistance in case of poor investment outcomes, these behavioral adaptations would have no repercussion on the cost of the income guarantee, since payments are independent of outcomes.

The case is more complicated for contingent payments. A danger of such guarantees is that their cost is not at all or only partially recognized by policymakers, since "on average" guarantees are not being called. It may therefore appear that the costs of these guarantees would be negligible. However, Smetters (1998, 2001, 2002) has demonstrated, a market-based evaluation of the value of guarantees along the line of the Black-Scholes (1973) option price formula can imply large unfunded liabilities. These calculations exploit the fact that a guarantee can be interpreted as an option to receive a payment if the value of retirement assets or the rate of return falls below a certain threshold. Lachane and Mitchell (Chapter 8, this volume)

provide an overview over the costs of guarantees and the implications of alternative financing strategies.

The intuition for this result derives from the observation that economic agents are generally averse to risk. Even though the probability to be penniless during retirement may be virtually zero, many people would probably pay a considerable amount of money to have a guarantee against that outcome. It would therefore be wrong to equate the expected value of the payments made under the guarantee with the *ex ante* value of providing the guarantee.

Merton and Bodie (1992) provide a useful framework for the management of risks generated by guarantees. They discuss three tools to manage these risks: monitoring risks, pricing guarantees, and imposing restrictions on assets. In the case of government retirement guarantees, these tools are of different applicability. Monitoring risks involves reviewing portfolios on a regular basis, marking them to market, and seizing assets or intervening in the activity of the guaranteed entity when the asset level moves dangerously close to one at which the guarantee will be activated. In the case of relatively small individual portfolios, it is virtually impossible for the government to monitor performance. Moreover, monitoring is subject to considerable arbitrariness. An agency charged with monitoring performance could acquire considerable power through its ability to intervene when risks are considered to be too large for the guaranteed entity (i.e. the pension fund or individual investor) to continue making decisions on its portfolio.

It would also be difficult to move to the *ex ante* pricing of guarantees, i.e. in form of an insurance premium paid to the government, since the latter would need to be based on individual circumstances given that each individual has a different portfolio and risk exposure.³ In view of the difficulties with individual monitoring and pricing of risks, a third way to limit exposure is to restrict portfolio investments. By regulating the composition of investment portfolios, the government can reduce the volatility of outcomes, limit moral hazard, and reduce the risk that guarantee payments must be made. At the same time, the exact specifications of asset restrictions will have ramifications on investment choices and thus may involve efficiency losses. The same problem of choice arises if the government decides to specify a “benchmark portfolio” with “acceptable” risk exposure to be covered by the government guarantee, with additional risk must be borne by the individual.⁴

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What are the practical implications of the above? First, guarantees are costly and their costs play an important role in designing DC pension systems. Second, government risk exposure can be limited through applying one or several instruments of risk management. Third, the ultimate mix between individual risk exposure, government guarantees, and government regulation, determines the viability of the pension system in the long term.

On the one hand, exposing too many retirees to the risk of poverty in old age will erode participant support for the pension system. On the other hand, too generous government guarantees or lack of appropriate risk management for guarantees can undermine government finances, and in the end they may lead to the same problem of sustainability faced by many pay-as-you-go systems.⁵

Retirement Guarantees around the World

What can retirement guarantees promise? The short answer is as much or as little as can be credibly committed to pay in case the guarantees are being called. The combination of promise and risk-management mechanism differs by country, but in looking at a variety of countries, some general patterns emerge. Table 11-1 summarizes key aspects of guarantees in national mandatory DC schemes. Next, we discuss three broad arrangements, along with more detailed reference to a few specific country cases.

The British Model and its Derivatives

The British pension model is characterized by a relatively high level of individual responsibility and the concomitant fairly high level of risk that remains with individual investors. Income support from the government is limited to a flat payment, conditional on the worker satisfying an extended period of coverage and contributions. The individual is largely left to fend for himself while retaining a large variety of investment choice. The addition of a second DB layer to the flat benefit dates only from 1975 (the so-called state earnings related pension scheme (SERPS)), and people can opt out through funded occupational or personal pension plans. Neither occupational nor personal pensions are subject to strict investment regulations, with most regulatory efforts concentrated on ensuring that people receive accurate investment advice.⁶

As a result of the UK government's commitment to a limited and non-contingent floor of protection, its risk exposure is limited to demographic change. Therefore, the freedom to invest that was left to workers does not create a contingent government liability. In this respect, the guarantee would appear to be a minimum pension promise, which the government could probably afford to keep. But, under current projections, the flat benefit is projected to decline from about 15 percent of average earnings in the mid-1990s to about 9 percent of average earnings by 2030, largely on account of a lack of adjustment for productivity growth (Budd and Campbell, 1998). By reducing the size of the benefit in relative terms and thus reducing the generosity of the guarantee in terms of average earnings, the British government seeks to encourage more funding and risktaking, while simultaneously reducing the relative size of the noncontingent guarantee. The main challenge for this strategy flows from uncertainty over the political consequences

TABLE 11-1 Guarantees and Portfolio Restrictions on Mandatory DC Pensions

<i>Country</i>	<i>Noncontingent Payments</i>	<i>Contingent Payments</i>	<i>Portfolio Restrictions</i>
Argentina	Flat benefit	Relative rate of return guarantee for pension funds (absolute rate of return guarantee for state-owned pension fund)	Yes
Australia	No	Means-tested flat benefit	No. "Prudent-man rule" for investment managers
Chile	No	Topping-up of phased withdrawals from retirement accounts (relative rate of return guarantee for pension funds)	Yes
Colombia	No	Topping-up of phased withdrawals from retirement accounts (relative rate of return guarantee for pension funds)	Yes
Croatia	DB pension	Minimum rate of return for pension accounts	Yes
El Salvador	No	Topping-up of phased withdrawals from retirement accounts (relative rate of return guarantee for pension funds)	Yes
Hungary	DB pension	Topping-up of annuity from mandatory DC pension (relative rate of return guarantee for pension funds, set annually)	Yes
Kazakhstan	No	Topping-up of low account balances	Yes
Mexico	No	Topping-up of phased withdrawals from retirement accounts.	Yes
Poland	Notional DC system	Topping-up of combined benefits from notional DC system and individual accounts (relative rate of return guarantee for pension funds)	Yes
Singapore	No	Absolute rate of return guarantee	Government makes investment decisions
Sweden	Notional DC system	No	Yes
Switzerland	Public and occupational DB plans	Means-tested flat benefit (absolute rate of return guarantee for pension funds)	Yes
United Kingdom	Flat benefit	No	No. "Prudent-man rule" for investment managers
Uruguay	DB pension	Topping-up of DB pension (absolute and relative rate of return guarantee for pension funds)	Yes

Source: World Bank and Social Security Administration databases on pension legislation. <www.worldbank.org/pensions and <http://www.ssa.gov/government>>

of shifting most of the responsibility to prepare and invest for retirement to individuals. It may happen that people making poor investment choices end up with lower retirement income than under SERPS and pressure the government to raise guaranteed benefits.

The Australian Superannuation System

The Australian system also originally limited old-age support to a relatively low government benefit and largely left individuals to prepare for their own retirement. In contrast to the United Kingdom, the income guarantee was means-tested and thus contingent on investment returns and labor earnings. This basic pillar is financed out of general revenue and not as a result of a contributory scheme, as under the British system. A mandatory funded second pillar was introduced in the 1990s, which relies mostly on employer-controlled “superannuation” funds. Most of these funds are run by employers and many do not allow individuals to control investment decisions, so their investment choices tend to be fairly conservative. As a result, even though the government provides a contingent payment, the lack of portfolio limits for pension funds does not appear to entice more risk-taking or pose serious threat to government finances. Nevertheless, the means-testing provisions of the Australian system combined with the possibility to withdraw retirement savings in a lump sum could lead people to run down assets or invest in assets that are not fully considered for the means test, such as housing. The interaction of the different pillars in the Australian pension system is discussed in more detail by Piggot and Doyle (Chapter 5, this volume). Prior to the expansion of superannuation plan coverage, more than 80 percent of Australian retirees were eligible for a full or partial government pension. If this trend continues, the mandatory funded second pillar may not have the expected salutary effects on future retirement income, in which case the means-tested benefit may need to be scaled back or unfunded spending on old-age support and may crowd out other government spending.

Provident Funds

Many countries with historical ties to the United Kingdom also adopted the so-called provident funds, among them, Kenya, Malaysia, and Singapore. These pool contributions in a mandatory DC fund, managed by the government and subject to government investment decisions, and the government often guarantees a minimum rate of return with its budgetary resources. At first sight, this may appear to resolve the bulk of the risk management problem, since the government as guarantor also controls the asset allocation in the pension fund. But if the minimum rate of return is sufficiently low, the government may prefer to use provident fund income to finance government operations (by selling government bonds to the fund, or investing

assets in projects and sectors receiving preferential treatment. The lack of transparency and exclusion of accountholders from investment decisions hampers their ability to evaluate investment risks and management acuity, and it also reduces the responsiveness of investment choices to rate of return differentials. As a result, provident fund performance has generally been poor compared with other investment funds, and some provident funds, for example, in Kenya, have been an almost continuous burden to the budget. When the government's financial position is weak, the governments may take larger risks with fund assets or to finance operations by borrowing from the fund, and the probability rises that the government may not be able to make good on its promises. In the extreme case, a provident fund system can become a pay-as-you-go system, where benefit promises depend entirely on the government's overall financial situation. In provident funds, therefore, the risk is that the government may change the generosity of guarantees.

Reforms in Latin America

A wave of pension reforms started in the 1980s, beginning with the Chilean reform, and followed by a number of Southern and Central American countries in the early 1990s.⁷ Under the Chilean model, workers newly entering the labor force and those opting out of the old system contribute to a privately managed pension fund selected from among several competitors. Workers who chose the new system receive so-called "recognition bonds" for their accrued claims under the old system.

The national Chilean system offers two types of guarantees. The first is a relative rate of return guarantee for pension investments. In this case, every participant is guaranteed a minimum annual rate of return no less than 2 percentage points below the average of other pension funds, or less than half the average rate of return of all pension funds, whichever is greater. If a pension fund cannot cover the minimum rate of return from its reserves, the government makes the payment and the pension fund is liquidated. To minimize the risks from the rate of return guarantee, the government not only protects investors from downside risks, but it also mandates that excess returns be held in a profitability reserve. In particular, returns exceeding the average return earned by other funds by more than 2 percentage points or exceeding twice the average return, whichever is smaller, are not allocated to individual accounts but kept in reserve. By protecting investors against downside risks but limiting their participation in upside risks, the government reduces its own risk exposure. As Smetters (2002) shows, taxing away good returns is an efficient way to reduce the *ex ante* value of government guarantees. Combined with the asset restrictions placed on portfolios (described below), this relative rate of return criterion tends to lead insurers to choose similar portfolios and thus produces limited portfolio choices for workers in the Chilean system.

The second form of guarantee in Chile is a minimum pension benefit payment for those who contribute to the pension system for at least 20 years, and for whom their individual accounts are too small to finance a minimum pension of roughly 75 percent of the minimum wage. Thus, long-term workers with too little pension saving receive a topping-up of their pension from the government, financed out of general government revenue. To reduce moral hazard, the government has imposed fairly stringent restrictions on the pension plan portfolio composition, limiting the level of equities and investments abroad.

As a result of these guarantees and regulation, the Chilean government participates in both upside and downside risks. By design, all fund managers have strong incentives to invest in similar portfolios, making large deviations from the mean a relatively rare outcome. The fact that returns in pension funds are fairly similar also limits the number of cases with low levels of retirement savings to those who had low labor incomes during their working lives, rather than those who made poor investment choices. The major risk exposure remaining is country-specific risk, in view of the limits imposed on foreign investments. In particular, the small size of the Chilean economy combined with the limited portfolio diversification implies that all pension funds will be exposed in case of national economic difficulties. This would not trigger the relative rate of return guarantee, but it could eventually require more topping-up under the minimum pension guarantee.⁸ The government could therefore be simultaneously exposed to poor economic performance and financial pressures generated from the minimum pension guarantee.

Variations on a theme: Argentina and Mexico

The Argentine system features a minimum rate of return guarantee similar to the Chilean setup. The main difference is that the relative rate of return guarantee is asymmetric, such that the provisions are triggered if a fund outperforms the average by 30 percent or falls short of the average by 70 percent. This asymmetry leads to larger government participation in upside risks and lower exposure to downside risk as compared with the Chilean case. The Argentine system also imposes similar portfolio constraints as the Chilean system, leading to similar herding behavior in pension funds.

In contrast to the Chilean case, the Argentine government offers a noncontingent basic pension floor for those having contributed to the mandatory system for 30 years or more. Worth about 25 percent of the average wage, this pension floor represents about the same level of income as the Chilean minimum pension guarantee. Pension portfolio choices therefore do not expose the government to additional risks and the costs of the flat benefit are not exposed to country-specific shocks. To the extent that the participation in upside risks already limits exposure to the minimum rate

of return guarantee, portfolio restrictions in the Argentine case may be redundant as compared to Chile. The anticipated costs of the universal benefit, however, may raise doubts about the government's ability to finance the benefit in the long term. Hence, while the government's contingent liability may be smaller than in the Chilean case, its overall unfunded liability appears to be larger, generating larger political uncertainty about the long-run viability of the benefit.

Recent economic difficulties in Argentina underscore the worry that the national funded pension system has not insulated pensions from the overall financial position of the government. In 2001, the government drastically reduced payroll taxes from 11 to 5 percent, which significantly cut pension savings inflows. More importantly, the government also obliged pension funds to buy short-term bonds with long-term deposits and exchanged public bonds for short-term loans. It then proceeded to convert dollar-denominated government debt at a rate of Peso 1.40 per US\$ compared with the then-current exchange rate of around Peso 3.5 per US\$ (Oxford Analytica, 2002). These transactions resulted in massive wealth losses for the pension plans and undermined confidence in the system, resulting in a sharp decline in contribution rates. As a result of these developments, the government's long-run liabilities to pensioners remain high and perhaps are unsustainable.

In Mexico, the individual account system introduced in 1997 features a minimum pension guarantee similar to the Chilean setup. By contrast, however, there is no minimum rate of return guarantee for pension funds and thus there is no government participation in any upside risk. Nonetheless, the government is potentially exposed to risky behavior by workers and pension funds because the Mexican minimum guarantee of about 40 percent of the average wage is substantially more generous than in Chile. In the Mexican case, as in Chile and Argentina, the investment risks are limited through portfolio restrictions imposed on pension fund assets.

It is noteworthy that the differences across systems in Chile, Argentina, and Mexico—even if they may appear slight—are significant in terms of the risk distribution between the government and workers, as well as the scope of reducing government restrictions on investment choices. The Chilean solution contains government liabilities through participation in upside risks, self-insurance, and portfolio restrictions, as well as a means test on pension assets. The Argentine system, while using similar risk management tools, kept a first-pillar DB program not contingent on investment outcomes, rather than opting for a means-tested topping-up. Therefore, the unfunded liability of the system is likely larger than in Chile and the rationale for portfolio restrictions less clear. By contrast, in Mexico, portfolio restrictions are a crucial element to limit government risk exposure in light of the absence of self-insurance against rate of return fluctuations and fairly generous government minimum benefit guarantees.

Reforms in Transition Economies

A second generation of pension reforms took place after the transition of Eastern and Central European countries to market-based economies in the mid-1990s. These reforms faced different circumstances than in many Latin American countries, as a result of larger retiree populations and larger formal labor markets with more substantial unfunded pension liabilities. As a result of the transition costs involved in moving to funded pension schemes, most of these countries opted to maintain a larger pay-as-you-go financed pillar than Latin American reformers (a notable exception is Kazakhstan).

In Hungary, the 1997 reform revised the existing unfunded DB system and instituted a mandatory DC pillar, with a contribution rate of 6 percent of salary. The DB plan continues to provide a replacement rate of about 50 percent, after 40 years of work. In addition to the benefit promised by the DB system, the Hungarian system offers a rate of return guarantee for the accounts maintained under the mandatory DC plans, along with a minimum benefit guarantee equivalent to 25 percent of the DB pension. This benefit guarantee would be called if pension accounts generate less than an average annual real rate of return of about 2 percent over a 40-year horizon.

The rate of return guarantee is specified annually by the supervisory board for private pension funds and, as in the Chilean case, provides for both upper and lower limits on returns. This setup implies that the government is guarantor of last resort and participates in upside as well as downside risks. When the rate falls short of the minimum, the difference is made up from pension fund reserves and further backed by an industry-wide guarantee fund, financed by mandatory contributions from pension funds and backstopped by the government. Returns exceeding maximum rates set by the supervisory board serve to boost pension fund reserves. The industry-wide guarantee fund also backs the minimum benefit guarantee. As elsewhere, the portfolio composition of Hungarian pension funds is subject to regulation.

The guarantees for the DC portion of the Hungarian pension system impose fairly limited risks on the government, due to the self-insurance mechanism for pension funds against return fluctuations and the modest returns necessary to generate sufficient wealth in pension accounts to avoid calling the minimum benefit guarantee. Of course, the government maintains its commitment to the fairly large DB pillar. In light of the retirement income derived from the first pillar, it would appear that the DC guarantees are intended to instill confidence in workers unfamiliar with an investment-based pension system.

In Poland, the unfunded DB first pillar was replaced with an unfunded notional DC system. Under a notional DC system, retirement accounts are credited with a fictitious rate of return, although no assets are actually

accumulated. The second pillar of the Polish system is a mandatory DC system financed with a payroll tax worth 7.3 percent of salary. The government guarantees a minimum pension of around 30 percent of the average wage from both pillars. In addition, the second pillar is covered by a relative rate of return guarantee similar to Chile's, except that restrictions regarding deviations from average rates are less stringent. Similar to the Hungarian case, the minimum rate of return guarantee is backed by a guarantee fund, which in turn is backed by the government, the ultimate guarantor. Polish law also imposes restrictions on pension fund portfolios.

As in Hungary, the ultimate rationale for multiple guarantees is unclear. Although these guarantees do not expose the government to excessive risks, given the participation of the government in upside risks, they seem unnecessary given the importance of the first pillar. Put differently, since the first pillar prevents people from being exposed to very low retirement income, one might ask whether the second pillar guarantees and the related portfolio restrictions to limit risk exposure are necessary. It is worth noting that Sweden, which served as an example for several Baltic and Eastern European states, did not add further guarantees to the promises made under the first pillar when it designed its mandatory second pillar DC plan.

Conclusion

Our review has identified a wide variety of pension systems with a mandatory DC component, and most of these include guarantees. In many cases, governments have opted for multiple guarantees, limiting the fluctuation of returns in individual accounts and setting a minimum for the benefits paid in retirement. The minimum income promises are in some countries contingent on pension fund performance, while in others they simply derive from the pay-as-you-go DB tier.

DC guarantees must be affordable in order to be credible. Too generous guarantees on investment returns or minimum benefits expose retirees to the political risk that governments may have to scale back payments if financial pressures rise in later years. In that respect, DC plans with guarantees may begin to look similar to traditional DB systems.

When guarantees are contingent on the investment outcomes, such as minimum rate of return guarantees and topping-up of investment accounts, governments have generally implemented risk management tools to limit their risk exposure. These tools include reserves, mandatory pension self-insurance, and restrictions placed on the composition of pension investment portfolios. Safeguarding public resources has tended to imply that rate of return and minimum pension guarantees come at the cost of limitations on portfolio choices.

Notes

¹The World Bank (1994) has proposed a three-pillar system. The first pillar is a pay-as-you-go financed benefit and it provides some basic retirement income or income guarantee. The second pillar is a mandatory DC plan, and the third pillar comprises voluntary savings plans. More generally, the first pillar includes not only standard DB pensions but encompasses all kinds of guarantees, means-tested benefits etc. that the government may offer to keep people above a certain minimum level of retirement income.

²Pension guarantees in voluntary pension system are discussed by Turner and Rajnes (Chapter 12, this volume).

³Charging a premium should not be confused with those reform proposals attempting to reduce risk exposure by simply raising the contribution rate to individual accounts. In the latter case, the expected account balances and payouts will increase because higher contributions generate higher retirement savings. By contrast, an insurance fee paid to the government is paid in return for the insurance provided and thus would not increase available retirement savings.

⁴Smetters (2002) discusses risk management through limiting guarantees to the returns of a standardized portfolio rather than offering a blanket minimum return guarantee. As a result, the insurance value of the guarantee declines and moral hazard to increase risk exposure is reduced because the guarantor participates in only some of the downside risks.

⁵Smetters (1998) shows that guarantees can be exactly equivalent to unfunded liabilities. The economic argument relies on the *ex ante* value of guarantees, which can be evaluated with the options pricing formula. Under certain specifications, the value of the insurance against downside risks of pension account portfolios can be exactly equivalent to the promise made under a pay-as-you-go system. In that case, even though notionally the government may have shifted from a DB to a DC system, the value of its promise has not declined and future taxpayers remain exposed to the same financial risks.

⁶See CBO (1999) for a more detailed overview of the British system and the reforms introduced in the 1980s.

⁷Diamond and Valdés-Prieto (1994) provide a detailed overview of the features of the Chilean system. Mitchell and Barreto (1997) discuss successor reforms in other Latin American countries.

⁸This risk is akin to the risk of a large corporation whose workers have invested most of their retirement savings in company stocks, with the important difference that sovereign government default is much less likely than the failure of a private enterprise. For a discussion of risk exposure in company pension plans see Mitchell and Utkus (Chapter 3, this volume).

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